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SOME POINTS IN PRINT MOUNTING.

BY ELLERSLIE WALLACE.

THE mounting of the finished photograph is something in which the operator will find every opportunity of showing his good taste. Although strictly mechanical so far as the manipulations are concerned, it will be found that æsthetic consideration, also plays a very important part in the final result.

To paste a print neatly on a piece of cardboard is no very difficult matter. It is true however that some persons whose "fingers are all thumbs" have trouble in learning how to spread the mountant evenly and at the same time to keep the print firmly in place so that the edges and corners shall not curl up and touch the brush. Persons also who may be quite expert in other kinds of pasting where the papers have no curl in them, will find albumen prints much more refractory, and probably have an apprenticeship to serve before they can trust themselves to handle a lot of valuable prints.

The making of a photographic print may be said to terminate when it is hung up to dry after the washing. The operation of trimming the print to its proper shape and size is so closely connected with the actual mounting that I wish to say a word about it before proceeding further, but I am not writing this for those who are compelled by business considerations to cut the prints all alike in a machine and mount them upon cards of a regulation size. I write rather in the interest of a very numerous class of photographers, both professional and amateur, who handle negatives of varying sizes, and who desire to trim the prints so as to give them the most effective appearance when finally mounted.

Three things are necessary for trimming prints. First, a large piece of flat glass—preferably plate; secondly, a glass shape to cut the prints by, and thirdly, a knife with a well-tempered blade, not too springy and tolerably sharp. The glass shape, of course, should be as nearly as possible the desired size of the trimmed print, but this is not absolutely necessary, if only it be ground strictly rectangular. A box with a little cotton in it should be provided, into which the glass shape should be carefully laid after work is done, for even the slighest nick in the edge or on the corners will unfit that side for use. Accurate trimming will depend upon the perfect flatness of the two glass surfaces; it will be found that if one or other of them is irregular, even the heaviest pressure the left hand can bring to bear upon the shape will not hold the edges of the print tightly, and the knife will then tear large notches in the paper instead of cutting.

It might seem absurd to advise anyone who is about to mount a lot of prints to see that they are properly trimmed first; but I have repeatedly seen persons who had returned from travelling with large collections of unmounted prints make every preparation for mounting them, either in elegant albums or on loose cards, and never think to look at the corners to see that they were square. The most convenient way of opening the prints (which are generally curled, up) is to lay them under the large flat glass upon which they are afterwards trimmed. In doing this, care must be taken not to turn down a corner. If the prints are very much curled, apply the edge of a table ruler to the back of each print, holding the thumb on the face, and by gently pulling work the curl out. It almost goes without saying that the fingers must be clean before commencing this operation, which is by no means a safe one to perform with such prints as are made on highly glossed paper; the albumen surface cracking under the the strain. In such cases I should prefer to lay them in a pan containing a quart of water, with from one to two ounces of pure glycerine, and after they become fully saturated, to remove and dry them between folds of clean white blotting paper.

Before leaving this part of my subject, I wish to advise all printers to hang their finished prints up to dry in pairs back to back;

bringing them together under the water, lifting them and draining them a moment, and then supporting them by the two upper corners by spring-clips strung on a long wire crossing the room. The prints when dry will be perfectly flat and require no straightening.

To soak a print off its mount is sometimes a most difficult matter. If it does not give way of itself after a couple of hours soaking in plain cold water, water lukewarm may be tried; it should never be hot, for the tone of the print will always be reddened. If the print requires trimming, this should be done on the original card before wetting. If a print refuses to leave the mount, it might be possible to succeed by squeegeeing the face of the print to glass, and then carefully working the old mount off in bits at a time with the finger-nail, followed with a gentle friction with a soft tooth-brush. Prints that have simply been rolled (not burnished) after mounting with a plain starch mountant, would come off easily, while those mounted with gelatine and waxed with an encaustic paste after the rolling, would probably never give way. Soaking off and remounting points is generally an unsatisfactory operation. If the print possesses any value, I should prefer to enclose it in a mat or passe-partout made to fit, rather than attempt to remount, particularly as the process of fading, if once started, would not be checked by the substitution of a fresh cardboard, and the print would thus be risked to no purpose.

It sometimes happens that stereoscopic views are reversed in the mounting. In such a case, trim each side (card and all) neatly down to the size of the print, and remount them in proper position on another card with rather thick glue containing a little chrome-alum. Pass the picture through a rolling press (not a burnisher) half an hour or an hour before mounting.

A short distance back I said that the printing might be considered finished when the prints are hung up to dry. But if a number of mounted prints collected from various makers be examined, it will be found that while some have the natural surface, others have been rolled, and others again passed through the burnisher. Now, while these finishing processes give the prints a beautiful brilliancy, they are really drawbacks so far as

the mounting is concerned. Not so much because the fine surface will disappear when the print is moistened, as because the fibre of the paper is more or less crushed in the process of rolling, and the mountant will "strike in" unequally, leaving ugly mottled spots when dry that cannot be removed. By holding each print up before a strong light it is easy to tell whether it has been rolled or not; the translucent patches, together with the abnormally smooth surface, prove that it has been through the press. A burnished print may show only the smooth, soapy surface which is dulled by a moment's contact with a damp finger. This is never the case with the rolled print. The safest plan to pursue in mounting prints that have been burnished or rolled is to apply the mountant, made specially thick for the purpose, to the extreme edges of the print only. A convenient way to effect this is to cut a stiff card one-third of an inch smaller each way than the print, and laying it down on the back quickly run around the edges with the brush.

I should never blame a printer for rolling unmounted prints so as to increase their good looks; but in making up albums of views or specimens, for instance, it will greatly increase the trouble and risk of mounting. It is possible to roll prints enough to give them a fine surface, that will remain in great degree after mounting, without incurring danger of the mottled spots just alluded to, but much care and skill are required. To one wanting the best surface for his prints in albums, I should give the advice to procure fine, very thin cardboard, and, having mounted and rolled the prints afterwards in the ordinary way, to paste them together in pairs back to back, so that each pair formed a leaf. Allowance should be made for the extra inch which the binder cuts off at one end to form the "guard" that inserts into the back of the album. The prints of course should be kept flattened under heavy pressure throughout the operation, until after binding. When albums are made up in this way, the binder should be instructed to insert a fly-leaf of good paper between each pair of leaves, so as to keep the prints from chafing, and not to trim the cards in the cutter more than is absolutely necessary. If the names of the photographs are to be written in by hand, it should

be deferred until the very last; if done before binding the chances are that each title will be about half trimmed away in the cutter.

Trouble of this sort is not met with when prints are mounted in ready-made albums. The surfaces of the prints, however, can never be so brilliant.

Our photographic journals have published thousands of recipes for mountants. After many years' practice in photography, and close watching of the behavior of prints mounted with different substances, I feel perfectly safe in recommending simply starch well boiled in preference to anything else. I have been greatly disappointed in the permanency of prints mounted with gelatine in any manner, either upon cards or upon glass. I went into this subject in detail in a paper read before the Photographic Society of Philadelphia in the early part of the year; and I may add that my opinion regarding the unreliability of gelatine as a mountant is sustained by some of the best operators in the city. Solutions of gelatine in alcohol are elegant preparations for mounting, and work very smoothly under the brush; they are most convenient also for the scrap-album purposes before spoken of, and in fact their only drawback is the very serious one of affecting the permanency of the print. Mountants containing glycerine (which is used to modify the extreme hardness of gelatine alone) are even more to be feared, from the fact that glycerine always attracts water, and is sure to retain any dampness present in the print even if the latter is seemingly quite dry. My own photographic collection of more than twenty-five years standing, and the experience of many of my friends, justify me in making the above condemnatory remarks upon a substance which is still largely used for mounting silver prints.

"**How** do you understand the phrase an 'impressionist picture?'" asked the country cousin of a city cynic as they stood in the art gallery. "Why, an 'impressionist picture' is one that leaves on your mind the impression that it is the picture of a cow, and the impression lingers until you look into the catalogue and read that it is the picture of a water spaniel."

SOLIO PAPER.

THE novelty of the month is a new printing out paper, put on the market by the Eastman Kodak Company of Rochester, N. Y., under the trade name of "Solio" Paper. The manufacturers announce that the paper was only put on the market after an extended series of experiments and a thorough trial, not only in their own printing department, but by leading photographers. It is claimed that the support is entirely free from injurious defects, and arrangements have been entered into for a continuous supply of the paper which will tend to obviate the vexatious delays so annoying to the profession.

The Company have issued the following directions for using the new paper:

Print in direct sunlight, covering thin negatives with tissue paper, allowing the print to get a little darker tint than the finished print should be. Place print without previous washing into the following:

COMBINED TONING AND FIXING BATH.

Stock Solution:

A.	Hyposulphite of Soda,	8 oz.
	Alum (common)	6 oz.
	Water,	80 oz.

When dissolved add 2 oz. borax dissolved in 8 oz. hot water. Let stand over night and decant clear liquid.

B.	Chloride of Gold,	15 grains.
	Acetate of Lead (Sugar of Lead),	64 grains.
	Water,	8 oz.

To tone 30 cabinets take

Stock Solution A,	8 oz.
Stock Solution B,	1 oz.

Tone to desired color, and immerse prints for 5 minutes in following Salt Solution to stop the toning:

Salt,	1 oz.
Water,	32 oz.

Wash 1 hour in running water or in 16 changes of cold water, when prints may be mounted same as albumen prints.

If prints are not to be mounted they should be squeegeed on ferrotype plates to give a glacé or ground glass to give a mat finish.

All solutions should be used as cold as possible.

In warm weather prints should not stand over night before mounting.

Mounted prints must be thoroughly dry before burnishing.

THE DANGER OF CHEAPENING ART.

BY XANTHUS SMITH.

WITH the ready means furnished by the various photographic reproduction processes now in use, there is a decided danger of an over-flooding of the community with bad art. Art for art's sake, that is, for its excellence, is a sentiment that ought to be ranked very high, and in order that art may legitimately fulfil its mission, it should be respected and upheld in so far as it is possible for it to be considering the varying tastes and requirements of the times.

Mere portrayal is not art, and should not be allowed to have any pretensions as such, though, we are sorry to say, that with so many as there are at present dabbling in art, and endeavoring to lay claim to more or less rank as artists, there is a constant tendency to a breaking down of the barrier which should exist between true art and the mere mechanical or unfeeling representation of any commonplace thing.

Any production to be a true work of art must, of course, be largely the production or emanation of an artistic mind. It should be the refined embodiment of many natural perfections or beauties. In fact, art consists in selection, arrangement, and emphasis.

All those who have a proper knowledge of art admit the perfection of the ancient Greeks in their sculptures of the human fig-

ure, and in how few instances their work has been rivaled in modern times, and as an insight to their mode of study, we are told of the fact of the great artist Praxiteles employing a number of models in making his studies for his celebrated Venus, although it is admitted that the Greeks were a very perfectly formed people, and it might be supposed that to have selected one perfectly formed individual, and copied nature exactly, would have given a sufficiently perfect result.

When we descend from Greek art and come into the lesser walks, we are not released, as it might be supposed we would be, from this exercise of the art faculty. If we would produce work of excellence, worthy to command respect, we must exercise mind and talent in what we do, and, therefore, no work of a mere machine can be ranked beyond its true level, being always, of course, to the greatest extent mechanical, and possessing merit only to the degree of its capabilities, beyond which any superior genius posessed by the operator cannot wield it.

Photography, we feel, may fairly be ranked much higher as a means of art portrayal than any of the simple mechanical processes, because it is not solely a mechanical process, but largely nature's work, and just in so far as it is nature's work, so far does it give us those refined qualities which constitute its greatest beauties and merits.

We all know that the curious working of nature in producing the photographic image is a mystery. There is yet an unknown link in the chain of operations and results. The sensitive film is impressed, but how we do not know. Exactly what takes place in exposing the sensitized film, that in after development causes the silver deposit, so subtile and so refined, upon certain portions just in the degree of force with which the rays of light have touched it, we are simply guessing at, and, therefore, we cannot call photography in its perfection entirely man's work as yet. We must yield, we feel, that superiority which all nature's work possesses.

Unfortunately we cannot say as much of any of the printing processes. They are all so far mechanical as to destroy those refinements and graces which lift such work into art. Of course

we refer to press work in our use of the word printing, and not to photographic printing from negatives. At their very best the majority of photo-mechanical prints are only tolerable, and when of a quality anything beneath the best, they are utterly intolerable to persons of good taste.

When we see, as we do now, such a profuse illustration of books, magazines, and pamphlets with bad reproductions of works of art and photographs, we cannot help regretting that so much time and means should be thrown away in the production of such work, and feeling that a much less amount of art and of a superior quality would really be a relief to the community and a benefit to it.

It matters not whether the original drawings, engravings, or photographs reproduced were good or bad, they are all reduced to the same level in the miserable flat smears that we get of them in the majority of the reproductions.

There is, we fear, a danger of a general debasement of public taste by having constantly put before it such crude and unrefined work.

Every one knows how completely chromo-lithography has been thrown into disrepute by a wholesale dissemination of excessively bad art work. Chromo-lithography has its excellences. The writer derives much gratification now from good art of this kind, and had care been exercised to respect this branch of art sufficiently to keep it up to a certain standard of excellence, thereby also reducing the quantity, we would not now find the whole cast under the stigma of "the vulgar chromo," and almost entirely debarred from a place in the genteel circle.

The truth is that cheapness does its work of destruction in this direction as in most others. It was the cheapening of the chromo that brought its downfall. What person of good taste can look upon any of the prolific auction daubs by which the art of painting is based, without a feeling akin to disgust; and are we not in the same danger with the photograph?

Certain processes there are which give us very pleasing and in every way satisfactory results in the art of photo-reproduction, because they require not only more painstaking care, but also

more skill, more brains, in fact, than the inferior ones, all of which must be paid for.

We will conclude by asking, would it not be better that we should have a few excellent embellishments in a book or a journal than a host of miserable mongrel productions such as we now see so largely palmed off as illustrations?

For our part, we should say, rather give us a few choice things that we might constantly refer to with pleasure, than a host of trash to be cast aside after the first view.

PHOTOGRAPHIC SEARCH FOR A PLANET BEYOND THE ORBIT OF NEPTUNE.

ISAAC ROBERTS, F. R. S.

THE hypothesis that one or more planets exist beyond the orbit of *Neptune* has been long entertained by astronomers, and Professor Forbes, in a remarkable paper on "Comets and ultra-Neptunian Planets," which he read before the Royal Society of Edinburgh at the beginning of the year 1880, predicted with considerable confidence that one or two such planets exist, and in the paper referred to he gave very fully his reasons.

The prediction was based upon the recorded positions of the aphelia of a number of comets. He said, "That there could be no longer a doubt but that two planets revolve in orbits external to that of *Neptune*, one about 100 times, the other about 300 times the distance of the Earth from the Sun."

In 1887, November, I wrote to Professor Forbes to ask him if he had further considered the hypothesis concerning the supposed planets, and that I was prepared to make a search for them by photographic methods. In his reply he stated that the present position of one of the hypothetical planets is 11h. 48m. R. A. and 3° N. Declination, and he believed that a range of 5° each way in R. A. and of 2° or 3° in Declination ought to find the planet if it is there. The motion of the planet he computed at one degreein 2.96 years.

I thereupon commenced the search, but soon found that the climate of Maghull was so unfavorable for celestial photographic work of this character that my task was nearly hopeless; but since the removal of my Observatory to Crowborough I resumed the search under conditions sufficiently favorable to complete the work, which was conducted on the following plan:

A chart was made of the region indicated by Professor Forbes between R. A. 11h. 24m. and R. A. 12h. 12m., with Declination 0° 0′ to 6° 0′ North. This region was covered by eighteen photographic plates, each of more than four square degrees in area, and allowed of sufficient overlap to show a number of the same stars on two or more contiguous plates. Two sets of photo-plates of the region were taken with an interval of not less than seven days between exposures, which were of ninety minutes duration, and the dual photographs were subsequently compared three times over by superposition, in order to see if any star appeared on one plate which was not on the other, or to see if change in the position of any star had taken place in the interval between the dual exposures. In this way the whole of the plates covering the region were very carefully examined, and it now only remains for me to report that no planet of greater brightness than a star of the 15th magnitude exists on the sky area herein indicated, nor is there on the plates any abnormal appearance to which it is necessary here to draw special attention. It is a region where the stars are not exceptionally numerous, and they are mostly faint.—*Monthly Notices, May, 1892.*

NEW TONING BATH FOR CHLORIDE PAPER.

BY WALTER D. WELFORD.

THE fact that all photographic papers have missed the principal points of the new toning bath for chloride paper, which I introduced to the London and Provincial Association on August 11th, leads me to write this note. For the mere sake of a new formula, I should not have devoted so much time and care, nor should I have taken up the time of any Society. In the

published reports of the meeting a feature is made of the formula itself, but little, if anything, said as to its advantages. It is in these latter that the merit lies.

I will first detail my experiments. Those who have worked years ago with prints from wet-plate negatives will remember the simple bicarbonate of soda toning bath, and the somewhat washy nature of the results, which made it useful for very brilliant prints, but not suitable for others. A slight bleaching action takes place, which was in turn an advantage and a nuisance.

Remembering this, I tried the old formula upon the new Eastman paper, but found no gain in any way until the strength of the bath was increased. I claim nothing for the use of bicarbonate of soda in the toning, but I do claim to have introduced a bath for chloride prints that possesses several valuable points, which are as follows:

1. The bath is made at time of use.
2. It is simplicity itself.
3. It tones the prints quicker than any other.
4. The unevenness of toning, which is usually the bugbear of chloride prints, is absolutely annihilated.
5. It gives a pleasing gray-black tone resembling platinotype.
6. Over-toning is impossible.

The prints are completely toned in one and a-half to two minutes. The tray need not be removed at all, and if six prints are immersed, it takes all the operator's time to keep them going. As fast as he can get them out of the tray, he can insert a fresh print.

Uneven or partial toning is really one of the strongest points, because, as a matter of fact, unless the prints show some trace of this, I get suspicious. I can completely tone half of a print first, then the other half, and no dividing line is apparent. A dozen air-bubbles or streaks can be left on the print, with the result of a dozen bright red spots upon the otherwise finished print; and yet, if these be covered over and the toning continued, there is no trace whatever when finished. The fact is—and here lies the merit of the whole thing—a definite tone being obtained, no amount of immersion in the solution (within reason of course)

will alter that tone, so that in the case of red spots they nearly catch up to the other part. This is very apparent if a print be toned, say, in four sections, as it is impossible to show the four degrees, the second one toning to the level of the first before the third can get a start.

As regards over-toning, I have left the prints an hour without any difference between them and those taken out in two minutes.

I claim that this bath makes the chloride paper easier and quicker to finish than any other silver paper, and it will even bear favorable comparison with any method of printing and finishing at present in use:

The bath is as follows:

Gold, - - - -	4 grs.
Bi-carbonate of Soda, - -	1½ drs.
Water, - - - - -	6 oz.

It will be noticed that, compared with the usual baths, it is exceedingly strong. I claim that, in conjunction with the use of bicarbonate of soda, as the feature of it. I see in an American paper that bicarbonate of soda is recommended, and in England borax is mentioned. But neither of these use such a strong bath. As a point of comparison, let me place the two baths together.

Gold, - - - -	4 grains.
Bicarbonate of Soda, - -	90 grains.
Water, - - - -	6 ounces.

Usual Carbonate Bath.

Gold, - - - -	4 grains.
Bicarbonate of soda, - -	16 grains.
Water, - - -	32 ounces.

It is evident, therefore, that I have done more than merely recommend the usual and old bicarbonate bath.

The prints need washing before toning, a slight rinse afterwards, and final fixing in a weak solution of hypo (say 1 to 6) for about ten minutes. Over-printing is necessary to allow for the bleaching and reducing action, but the actual tone of the print does not change at any period of the fixing. The prints must be judged by looking through to a strong light. As soon

as the last trace of red or brown has gone, it is finished. For those who prefer a warmer tone and slower action, it is only necessary to double the quantity of water, and rock the tray.

My own opinion—doubtless an egotistical one—is that this bath will do much to popularize the use of gelatino-chloride papers; because, although the manufacturers declare that a child can tone their paper, and that if a photographer cannot he is a muff, yet I am certain that many have found difficulties in toning, which all those who have worked with the above bath declare to have completely vanished.

In conclusion, let me say that the bath is applicable to at least seven or eight kinds of chloride paper, but as it appeared to work best with that issued by the Eastman Company, I demonstrated the bath before Mr. Walker, and placed it unreservedly in the hands of the Company, who will adopt it if the tests they make be satisfactory.

I apologise for the length of this communication, but I am anxious that this matter should be placed correctly before the photographic world.—*Photographic Work.*

Mounting Paste for Lantern Slides.—For attaching lantern slide bindings to the glass nothing is better than bichromated paste, which is used for attaching paper to glass in the manufacture of electric instruments, and which is a most useful paste for many purposes in damp climates. It is made as follows:

Flour	2 teaspoonfuls.
Water	4 ounces.
Bichromate of potash	5 grains.

The flour must be rubbed to a smooth paste with the water, then placed in a saucepan over the fire and kept stirred until it boils. Add the bichromate slowly, stirring all the time; then stand to cool.

This paste must be kept in the dark, and used as soon as possible. Soak the paper in it, and attach to the glass, then place in direct sunlight for a day. This sets up a chemical change in the bichromate, and renders the paste insoluble.—*Journal of the Photographic Society of Japan.*

AN IMPROVED METHOD OF PHOTO-ETCHING ON ZINC AND COPPER.

THE object of a recent British invention is to produce, by means of photo-etching on zinc and copper, plates suitable for producing in half-tone the highest class of printed work, such plates being prepared, ready for printing from, in less time and at smaller cost than any plates of whatever description now used for printing from.

According to the method, a tin-plate of suitable size and shape is taken and covered with a coat of lamp-black, and when this is dry the manipulator coats over the lamp-black with Chinese white, and thoroughly dries the plate. He then, by means of an ordinary ruling-machine, rules on the prepared plate, through the white only, diagonal, horizontal, vertical or crossed, straight, waved or jagged lines. This operation leaves the plate showing black lines on a white ground. He then throws an enlarged image of the picture or design to be printed on the ruled plate by means of a magic-lantern. He takes a negative of the dimensions of the finished print by means of a photographic camera in the usual way, from the picture or design as thrown on the tin-plate by a magic-lantern, and prints from such negative on the zinc or copper plate, which has been previously sensitized with bitumen, and develops the picture on the zinc or copper by the aid of turpentine, in the usual way. If the plate used is of zinc, he next immerses it for about thirty-five minutes in a bath of three parts nitric acid and twenty parts water by measure. When removed from the bath, he sponges off all the acidulated water with a solution of gum-arabic and water. The deep shadows will now be well visible. He next immerses the plate for about five minutes in a saturated solution of carbonate of soda, and then places it under running water for a short time, and lightly rubs it with a soft rag or brush, for the purpose of cleaning the picture from any deposit of nitrate of zinc. When the plate is sufficiently washed, he inks it with ordinary printer's ink, and dusts it well with powdered resin. The loose powder is blown off, and the plate again immersed in the acid bath, and,

after allowing it to remain therein for about an hour, he removes it therefrom, and washes it well with oil of turpentine. He next inks the plate with etching-ink, composed of equal parts of paraffine wax, tallow, and printer's ink, and replaces it in the etching-bath for about thirty-five minutes.

To accelerate the etching process, he may add to the bath for the two last etchings, a little at a time, a small quantity of both sulphuric and hydrochloric acids, the quantity to be in proportion to the hardness of the plate. When sufficiently etched, the plate is mounted on wood, and is then ready for printing from. If the plate to be prepared for printing from consists of copper instead of zinc, for the first two etchings substitute for the nitric acid an equal quantity of a saturated solution of perchloride of iron in the etching bath above described, the bath for the third etching being the same as hereintofore described for zinc plates. Or, instead of photographing an enlarged picture onto the ruled plate, as hereinbefore described, a photographic negative may be taken direct from the picture drawing or object to be produced, and another negative (wet plate) from the ruled plate. These negatives place in a magic-lantern, with the negative from the ruled plate in front, and throw the combined image from both negatives for a sufficient time direct on to the zinc or copper plate, which has previously been sensitized with bitumen. After the picture has been developed on the plate by turpentine, the plate is then etched and prepared as hereinbefore described. This process is also suitable for preparing zinc or copper matrices for making India-rubber stamps, and for engraving zinc or copper seals or dies in intaglio or relief, but when engraving in relief is required, a positive photograph must be used instead of a negative.—*Paper and Press.*

Mr. T. C. Hepworth has been giving a series of lantern exhibitions at the Crystal Palace, using a specially-devised form of electric lantern. An experiment was tried of illuminating the screen by lime-light, and then on the disc thus formed a slide was projected by the electric light, when even the finest details of the picture were seen with distinctness.

EARLY DAGUERREOTYPE DAYS.—V.

AN HISTORICAL RETROSPECT.

BY JULIUS F. SACHSE.

(*Continued from page 410.*)

LEVITSKY, who saw this effort,[11] describes it as a small plate, six by eight-and-a-half c.m., which showed all the characteristics of a first effort. The silver plate had been fumed with chlorine and iodine. It represented the full figure of the king, seated in a reclining-chair.

The application of bromine as an accelerator was not used in Paris until June 10th, 1841, when it became known to Claudet.[12]

Strange as it may appear, photographic portraiture was not a success in Paris until the advent of an American in 1845, viz.: Warren Thompson, of New York. Thompson came to Paris without being able to speak a single word of French. He merely had a letter of introduction from the Russian consul in New York to the vice-consul, Iwanow, in Paris. The latter turned the American over to Levitzky, who received him cavalierly, supposing him to be a mere amateur. He was soon disabused when Thompson produced his specimens.* They proved far better than anything which had so far been seen in Europe. Neither Paris, Vienna, nor Rome could produce such results. Levitzky, then one of the leading daguerreotype artists in Paris, writes: "They were not mere daguerreotypes, they were works of art."[13] Here was strength, relief, artistic lighting, softness of shadows, with a wealth of half-tones. All specimens were on half-plates. This in itself was a revelation, as thus far in Paris nothing larger than quarter-plates had been used.

Thompson at once opened a studio in a large building in Boulevard Poissonier, Maison du pont de fer. The studio contained two stories, with three large rooms, having large windows. So superior were Thompson's results, that, notwithstanding the

[12] Humphrey, Vol. XII., p. 109.
[13] *Photographische Zeitung*, Vol. XVI., p. 221.

competition of native operators, his sitters averaged from thirty to forty per day.

Levitzky himself returned to Russia, and became one of the pioneer photographers in his native city of St. Petersburg. His studio is in the Newsky Prospect, opposite the Kasan Cathedral.

After Dr. P. B. Goddard's bromine process became known, through the publication of the process in the magazine of the American Philosophical Society, professional portraiture spread over the whole civilized world with great rapidity.

THE DEVELOPMENT OF HELIOGRAPHY.

As the years 1840 and 1841 progressed, and the splendid results obtained by Cornelius and others in Philadelphia became known, the Daguerre process received an impetus which spread its capabilities for portraiture and practical work not only among scientists, but with the public at large, but owing to a lack of knowledge of the Philadelphia accelerating agents it was slow in coming into practical use.

It is true that attempts were made to open establishments for portraiture in different cities in the hope of making the new process a source of profit similar to Morse's and Walcott's ventures in New York. These, however, were all crude establishments, patronized mostly by persons who were impelled by curiosity, more to see the process than with the expectation of obtaining a lasting portrait.

In the early days of photography one of the chief points made against the new process, both at home and abroad, was the charge that the results were not permanent,—a feature which, it was charged, would prove the great obstacle to the practical use of Daguerre's photogenic process, as the images were of so delicate a nature, and so easily injured, that the slightest touch would efface them. This apparent deficiency in Daguerre's process was strongly dwelt upon in an article in the *Mechanic's Register*, of London, early in the year 1840. Daguerre himself suggested that if only a varnish could be found which might easily be applied to the surface of the plate after the completion of the

picture, which would protect them from injury without impairing their delicacy, it would undoubtedly add considerable value to his discovery.

Not long after these comments appeared in the scientific journals, the eminent French chemist, M. Jean Baptiste Dumas, announced[1] that he had discovered a varnish which would have the desired effect of protecting the developed image. This consisted of a liquid compound of

Dextrine, - - - - -	1 part.
Water, - - - - -	5 parts.

This mixture—the first preservative on record—seemed well adapted for the purpose, and continued in use until Fizeau's method of fixing became known early in 1842. This consisted in coating the plate with a solution of chloride of gold, and then drying it by means of the flame of a spirit lamp.

This discovery of a simple process solved the question of a fixing agent, and, together with Dr. Goddard's application of bromide, paved the way for the extension of the photographic process throughout the civilized world.

THE FIRST PHOTO-MECHANICAL REPRODUCTION.

The most important event to be chronicled for the year 1841 is the first application of Daguerre's process to the production of ordinary printing plates. Here again the honor belongs to one of Philadelphia's scientists, viz.: Joseph Saxton, the same who made the first heliograph in America; and it is a noteworthy fact that the impressions from this plate made half a century ago have never been surpassed for softness and beauty of finish.

The causes which led to its production were as follows: During the year 1841 Jacob R. Eckfeldt and William E. DuBois, assayers of the United States Mint, prepared a manual of "Gold and Silver Coins of all Nations, illustrated by numerous engravings of coins, all executed by the medal ruling machine, invented by Joseph Saxton."

[1] Journal Franklin Institute, Vol. xxv., p. 142.

As the work neared completion it was suggested to have a picture of the Mint as an illustration or frontispiece. As there were neither steel nor copper plates of the subject it was determined to make one which would be in harmony with the rest of the work. How this was accomplished the following quotation from the book in question will show, viz.:

"To obtain the vignette of the Mint (which is on the title page), as there was no medallion to rule from it was required to go back to the original, and this necessity brought into play another brilliant invention of modern times, the *daguerreotype.* A picture of this edifice was taken with this instrument by Mr. Saxton, from which a copy was engraved in soft metal by Mr. Gobrecht; from this copy a counterpart was obtained in copper by the electrotype, and therefrom the engraving was effected. This view is therefore commended to the reader, not only as a faithful and beautiful transcript of the original, but as combining in its production three discoveries which adorn the present age, the *daguerreotype*, *electrotype*, and *machine-engraving.*"—(Manual of Gold and Silver Coins, Philadelphia, 1842, p. 189.)

PROFESSIONAL STUDIOS.

The advent of the year 1842 marked the opening of strictly professional galleries for Daguerrean portraiture as a commercial venture in several of the leading cities in the Union, these were under the control of John Plumb, Jr., who placed them under the supervision of employés as soon as established. Plumb's first gallery in Philadelphia was opened at 173 Chestnut Street, now 505, three doors above Fifth Street on the north side, opposite Independence Hall. Here he continued for three years, until Samuel Van Loan opened a similar establishment at No. 140 Chestnut Street (south-east corner of Fifth Street). Plumb then removed his gallery to No. 136, two doors above the Custom House.

To John Plumb, Jr., probably belongs the questionable honor of being the first to debase heliography, and attempt to monopolize Daguerrean portraiture in this country, and thereby drag the art into the rut of ordinary competitive trade. In the establishment of his various gallaries he seems to have had no interest in the advancement of the art. His only object was to turn out

cheap goods, quality or artistic effect being of secondary consideration, similar to the peregrinating tintype artist of the present day.

The results of Plumb's schemes were but natural; men in the different cities, who had the interest of the art in their minds, soon broke down the daguerreotype monopoly sought for by Plumb.

With the slow and uncertain methods of communication at that day Plumb of necessity was forced to neglect some of his ventures. The consequence was that in less than four years the would-be daguerreotype monopolist became reduced, through the heedlessness and wastefulness, if not absolute dishonesty, of his agents, so that from being possessed of a competency the year 1847 found him literally penniless, with most of his fine establishments passed into the hands of those in whom he had confidently trusted.[2]

MOSER'S "INVISIBLE LIGHT."

A curious episode of the year 1842 was the publication of Moser's experiments,[3] proving, as it were, the existence of invisible photographic rays. Moser himself used the paradoxical term "invisible light."[4]

Moser's claims were that:—

(1) All bodies radiate light even in the dark.

(2) The light does not appear to be allied to phosphorescence, for there is no difference perceived whether the bodies have been kept long in the dark, or whether they have been just exposed to daylight or to direct solar light.

(3) Two bodies constantly impress their images on each other, even in complete darkness.

(4) However, in order that the image be appreciable, it is necessary, on account of the divergence of the rays, that the distance of the bodies should not be very considerable.

[2] Root, "History of Heliographic Art."

[3] Journal of Academy of Sciences, Paris.

[4] Eder. Handbuch der Photographie, 2d edition, Vol. I., pp. 149, 182, 187.

(5) To render the image visible, the vapor of water, mercury, iodine, etc., may be used.

(6) There exists latent light as well as latent heat, the former of which radiates in accordance with the law of inverse squares.

This announcement from the Königsberg scientist caused great surprise both in Europe and America, and the American Philosophical Society of Philadelphia at once instituted a series of investigations, which were brought before the Society at one of the series of special meetings which formed part of the great Centennial festival of that institution.

It was at the meeting held May 30th, 1843, that the fallacy of Moser's theory was proved by Joseph Saxton.[5]

At this meeting Dr. Paul Beck Goddard called attention to the experiments of Moser, by which he claimed to prove the existence of invisible photographic rays.

He said that in repeating the experiments with much care, he had failed to obtain an image. This failure he ascribed to the fact that before attempting the supposed photographic process, he had made the cameo or coin which was to produce the image, and the plate on which it was to be received, *perfectly clean*.

On mentioning the circumstance to Mr. Joseph Saxton, of the United States Mint, whose expertness in experimenting was well known to the members of the Society, he learned that numerous and careful trials had proved to his satisfaction that the effect

[5] In view of the resurrection of this fallacious theory at regular intervals, since it was incorporated by Robert Hunt in his "Photography" (2d edition, 1853, p. 170), the whole of the proceedings before the American Philosophical Society are reprinted. Strange as it may seem, within the past few months, June 24th, 1892, this subject was the leading theme of discussion at the Physical Society of London. The final view at this meeting was one touched on by Professor Sylvanus Thompson, wherein he states:

"For all we know, many objects may be glowing with electrical oscillation, and, indeed, there may be a world of light and color, opacity and transparency, totally closed to our senses,—a world of force and energy making such communications between persons and things as are altogether beyond our conception. Indeed, we must not loose sight of the fact that the wide range of oscillatory force, of which light is a small section, is, for the greater part, closed to human senses and perception."—*Photographic Work.*

An American contemporary, no doubt stimulated by the above, republishes Hunt's translation of Moser's theory, with the editorial comment that "until now the phenomena related in these articles have not received any practical application, but we [*i. e.*, the editorial staff] think it possible to utilize some of them in the processes of industrial photography.

remarked by Moser was due to the evaporation of some greasy substance from the surface of the object forming the image, and that when this had been first carefully removed, no image was obtained.

This had recalled to Dr. Goddard's mind an observation which he made some years ago, while prosecuting a series of experiments on the daguerreotype. He had wrapped some highly-polished plates in a very old newspaper for the night, and found in the morning that the outer plates had received a perfectly distinct image of the printing that had been in contact with them. Thinking that this was owing to the contact, he enclosed some similar plates in very fine and clean tissue paper, and wrapped the newspaper over this; but the impression appeared in the morning as before, the oil having traversed the tissue paper. This led him to the precaution of employing tin boxes to keep the plates in when made ready for the daguerreotype process.

Dr. Goddard concluded by expressing his entire concurrence in the opinion of Mr. Saxton, that the effects observed by Moser were due to the evaporation of oily or other organic substances which had accumulated on the surface of the body forming the image, and that the agency of heat was important only as it facilitated the evaporation.

He added, as his belief, that all substances evaporated at all times and under all temperatures; the only difference being in the rate: in one case it was inappreciable from its slowness, in another it was distinguished readily by the phenomena which it produced.

In the course of his remarks, he alluded to *the first employment of bromine* in the photographic processes, and exhibited the first daguerreotype specimen produced by means of it. It was made in Philadelphia, by himself and Mr. Cornelius, in *December, 1839.*

The remarks of Dr. Goddard led to a free conversation on the subject, in which Mr. Saxton, Professor Henry, Professor James Rogers, and other gentlemen took part. In the course of it, the following account was given of Mr. Saxton's experiments:

A gold coin, half an eagle, which had been dipped in pure nitric acid, then washed in distilled water, and afterwards dried by whirling

in the air, was placed on a well-prepared daguerreotype plate, and suffered to remain undisturbed for four days. At the end of this time no impression was visible when the plate was breathed on, except at two spots corresponding to the opposite sides of the coin where it had been grasped by the wooden pincers when plunged into the acid. A copper coin was next placed above a daguerreotype plate, with nothing between them but an exceedingly thin plate of mica, which had been split from the middle of a thick piece. But after so remaining for three days, no impression of the coin could be observed, though the mica was found, by actual measurement, to be less than the one-thousandth of an inch in thickness. The same coin placed on the same plate, without the interposed mica, gave an impression in the course of four hours; and when the coin was slightly warmed, a like effect was produced in one hour.

To determine if there was any difference in the screening effect of different substances, a thin plate of sulphate of lime was next placed between the coin and the prepared plate, and the whole suffered to remain five days; at the end of this time, however, no image could be perceived.

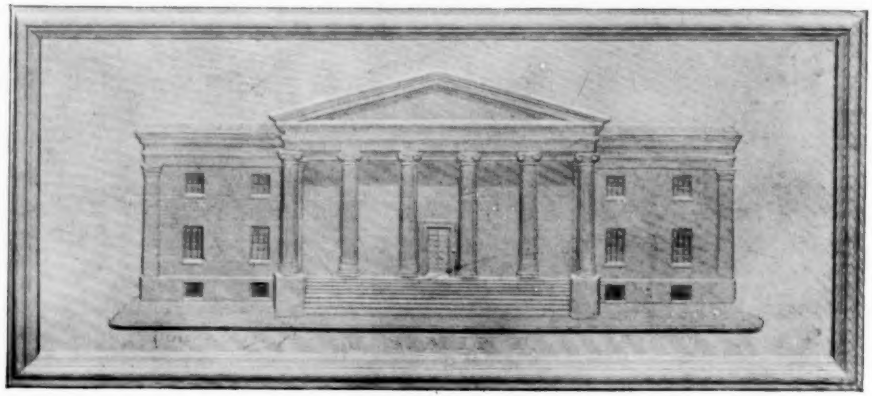
In another experiment, a thin plate of glass was interposed between the coin and the plate, with the same negative result. The experiments were also varied by using different metals; but in no case were any effects produced through the thinnest transparent substance which could be procured.

That this was not due to the distance of the coin from the plate, was evident from the fact that when the former was supported by pieces of mica under the edges, at the same distance as in the last experiment, an image of the part of the coin not screened by the mica was impressed on the plate, while no such effect was produced by the parts under which the mica was placed.

As, then, those parts of the coin which are either perfectly clean or which have been thus screened give no image, the conclusion is that the effects observed by Moser are due to the evaporation of the volatile matter which has infilmed the coin. Some parts of the coin, such as the salient points of the figures, would be differently soiled from the others, and would also evaporate the volatile or fatty matter differently; and when the coin is placed very near a polished surface, the condensation of the evaporated matter on this surface would be different at different points, and present the appearance of an image.

The principle of the formation of these images may be simply illustrated by slightly touching the point of the finger to a clean plate of

AMERICAN JOURNAL OF PHOTOGRAPHY,
OCTOBER, 1892.



THE FIRST PHOTO-MECHANICAL REPRODUCTION.

MADE BY JOSEPH SAXTON, A.D. 1841.

NEGATIVE BY JULIUS F. SACHSE.

VIDE PAGE 453.

glass. If the plate be afterwards breathed on, the vapour will be differently condensed on the parts which have been in contact with the raised lines of the skin ; and hence an image of the surface of the finger will be exhibited on the glass. If the finger could be held at the distance of the one-fiftieth of an inch for a few hours, the same effect would be produced by the unequal vaporization.

The same conclusion has also been arrived at by M. Fizeau, and was communicated to M. Arago in November last ; but the investigations of Mr. Saxton were entirely independent of any knowledge of the French experiments, and his explanation of the phenomenon had been communicated to Professor Henry and other members of the the Society, before any account of the experiments of M. Fizeau reached this country.

Professor Rogers also mentioned that he had repeated some of the experiments of Mr. Saxton at the time, and has been fully convinced that his explanation of the images was the true one.—(Proceedings of the Am. Philo. Society, Vol. III., pp. 179, 180, 181).

(*To be continued.*)

A Photo-electric Detector.—News comes from Toledo, O., of the successful use there of a camera and flash light in the detection and identification of two young burglars.

This new photo-electric detector works as follows:—The flash-light powder is placed in a small cup above a disk roughened on the under side, beneath which is a common lucifer match held vertically against it.

As the burglar enters he steps on the electric mat on the floor, thus closing the circuit. This throws a switch over so that the flash-light apparatus is now in the circuit. The spring which controls the disk over the lucifer match is set in motion, the match is lighted, and the flash light material is ignited. Through the powder box containing the flash-light runs a light fuse wire, which is a part of the circuit controlling the operation of the drop-shutter of the camera. Therefore, as soon as the flash goes off, the fuse wire is destroyed, the circuit to the camera shutter is closed and the latter drops, the picture having been secured in the brief exposure of the plate. It will be observed that the exposure and the flash are simultaneous, and the exposure is completed by the action of the light itself. The inventor has twice employed the apparatus to detect thieves, and each time with success.

ELEMENTARY THEORY OF THE EQUIVALENT FOCUS.
IV.

BY PROF. HENRY CREW, LICK OBSERVATORY.

Definition of Symbols Used.—

f_2 and f'_2 = first and second focal points of surface "2"; or, in the case of a combination of lenses, the first and second principal foci of lens "2."

F_2 and F'_2 = first and second focal lengths of surface "2"; or, in the case of a combination of lenses, the first and second principal focal lengths of lens "2."

f_4 and f'_4 = same as f_2 and f'_2 except that they refer to surface or lens "4."

F_4 and F'_4 = same as F_2 and F'_2, except that they refer to surface or lens "4."

$f_{2,4}$ and $f'_{2,4}$ = same as f_2 and f'_2, except that they refer to the combination of surfaces or lenses "2" and "4."

$F_{2,4}$ and $F'_{2,4}$ = distances of first and second principal foci of combination from f_2 and f'_4, respectively.

F and F′ = first and second principal focal lengths of the combination.

a = position of luminous point on axis.

a' and a'' = positions of first and second images of a, respectively. When only one image is considered, a' alone is used.

I = height of object.

I′ and I″ = equal height of first and second image of I, respectively.

L is always the distance of an image or object from the focus of the surface or lens indicated by the subscript.

K always denotes the distance of an image or object from the focus of a combination indicated in the subscript.

T = thickness of a lens.

D = the distance from the second principal focus of a second surface or lens.

$W_{2,3}$ = the distance from the second principal point of the first lens to the first principal point of the second lens of a combination.

H = distance from the first principal point to the second principal point of a lens or combination.

H_1 = distance from first to second principal point of the *first* lens of a combination.

H_2 = distance from first to second principal point of the second lens of a combination.

C' = distance from back surface of lens or combination to the second principal point of lens or combination.

Numerical Illustrations of the Preceding Equations.

I.—*Case of Refracting Surface.*

Given, a spherical surface, convex towards the incident ray, having a radius of 4 inches, and bounding a medium whose refractive index is 1.6. *Required,* the second principal focal length.

Here, R_2 is positive and, hence, Eq. 9 gives us

$$F_2' = \frac{1.6}{0.6} 4 = +10\tfrac{2}{3} \text{ inches.}$$

Eq. 11 gives at once the first principal focal length thus

$$F_2 = -\frac{+10\tfrac{2}{3}}{1.6} = -6\tfrac{2}{3} \text{ inches.}$$

II.—*Example of a Concave Meniscus.*

Imagine a simple lens made up of the two following surfaces. The first surface (the one denoted by the subscript "2") has a radius of curvature of +6 in. The second surface (the one denoted by the subscript "4"), has a radius of +5 in. The thickness of the lens is 0.3 in., and the refractive index of the glass is 1.5. What is the "equivalent focus"?

Here we have given R_2, R_4, μ, and T, to find F.

Since, Eq. 25,

$$F = \frac{F_2 F_4}{D}$$

it will be necessary to compute F_2, F_4, and D.

By Eq. 10,

$$F_2 = \frac{-6}{1.5-1} = -12 \text{ inches.}$$

and

$$F_4 = \frac{-5}{\left(\frac{1}{1.5}\right)-1} = +15 \text{ inches.}$$

By Eq. 11,

$$F_2' = -\mu F_2 = +18 \text{ inches}$$

Since

$$T-D = F'_2 - F_4$$

$$D = 0.3 - 18.0 + 15.0 = -2.7 \text{ inches}$$

Hence

$$F = \frac{F_2F_4}{D} = \frac{(-12)(+15)}{-2.7}$$

or

$$F = +\ 6.6 \text{ inches}$$

and

$$F' = -6.6 \text{ inches}$$

From the negative value thus obtained for the second principal focal length (the equivalent focus) it is evident that the lens is a divergent one, and that the first principal focus is to right of the first principal plane. Eq. 25 might also be employed, by substituting from Eqs. 9 and 10, to determine what refractive index must be employed to produce a lens of any given focal length.

III.—*To find the Separation of the Principal Planes.*

For this purpose we have only to substitute in Eq. 32 as follows:

$$H = T\left(\frac{T - R_2 + R_4}{D}\right) = 0.3\left(\frac{0.3 - 6 + 5}{-2.7}\right)$$

or

$$H = +\ 0.077 \text{ inches } +$$

Note the positive sign, which here indicates that the second principal plane is to the right of the first.

IV.—*To find the Position of the Principal Planes.*

Up to this point, we have only found how far apart these two planes are. If it be asked in what part of the lens they are situated, either Eq. 33 or Eq. 34 will answer the question.

The distance of the first principal point from the first surface of the lens is, Eq. 34,

$$C = \frac{F_1 T}{D} = \frac{(-12)\,(+0.3)}{-2.7}$$

or

$$C = +1.33 \text{ inches}$$

This shows us that the first principal point is more than an inch outside of the glass, and is to the right.

Let us find the second principal point. Its distance from the second surface is C′, where, Eq. 33,

$$C' = \frac{F'_4 T}{D}$$

Now, Eq. 11,

$$F'_4 = -\mu\, F_4 = -\left(\frac{1}{1.5}\right)(+15.)$$

or

$$F_4 = -10 \text{ inches}$$

Hence

$$C' = \frac{(-10)\,(+0.3)}{-2.7} = +1.111 \text{ inches}$$

The second principal point is also more than an inch to the right of the lens.

Check.

If our computations are correct, we should have an identity on substituting, in the following equation, the numerical values which we have obtained

$$T + C' = H + C$$

$$0.3 + 1.111 = 0.077 + 1.33$$

or

$$1.41 = 1.41$$

V.—*Example of a Combination of Lenses.*

The use of these equations may be well illustrated in the determination of the cardinal points of one of the new telephotographic lenses. Let us consider a combination made up of an 8-inch positive element and a 2-inch negative element. Suppose the positive element in front, and suppose the adjacent principal planes of these two lenses to be separated by a distance of 6½ inches. If the principal points of the

first lens are separated by 0.1 inch, and those of the second lens by 0.05 inch, we shall have, for data

$$-F_2 = F'_2 = +8.0 \text{ inches}$$

$$H_1 = +0.1 \text{ inches}$$

$$-F_4 = F'_4 = -2.0 \text{ inches}$$

$$H_2 = +0.05 \text{ inches}$$

$$W_{2,3} = +6.5 \text{ inches}$$

Required. (*a*) The magnifying power of the combination as compared with the single positive element.

(*b*) The "back focus" of the combination.

(*c*) The distance apart of the principal planes.

For the "equivalent focus" we have, Eq. 38,

$$F = \frac{F_2 F_4}{D}$$

$$D = W_{2,3} - F_2' + F_4 = 6.5 - 8 + 2 = +0.5 \text{ inches.}$$

This gives for F

$$F = \frac{(-8)(+2)}{+0.5} = -32 \text{ inches}$$

Since the positive element has a focus of 8 inches, the combination will give a picture on the ground glass enlarged four times. Mr. Burnham has described in the *Beacon*, for April, 1892, a very convenient and satisfactory method of using such an enlarging lens in an ordinary camera.

(*b*) Let us now proceed to find the "back focus" of the combination. This is done immediately by substituting in Eq. 42

$$C' = F'_4 \left(\frac{W_{2,3}}{D} + \frac{T_2}{D_2}\right)$$

In the present case, and indeed in many others,

$$\frac{T_2}{D_2}$$

is negligibly small compared with

$$\frac{W_{2,3}}{D}$$

So that we are quite safe in employing the approximate expression,

$$C' = F'_4 \frac{W_{2,3}}{D} = (-2)\,\frac{(+6.5)}{(+0.5)}$$

or

$$C' = -26 \text{ inches}$$

That is to say, the second principal point is 26 inches to the left of the concave lens.

The "back focus" is, therefore, 6 inches, the ground glass being 32 inches behind the second principal point. From the ground glass to the positive lens is then 14 inches. For using a combination of this kind, therefore, a camera would require a draw of 14 inches.

(*c*) For the distance apart of the principal planes, we have only to substitute numerical values in Eq. 41.

$$H = H_1 + H_2 - \frac{(W_{2,3})^2}{F_2' + F_4' - W_{2,3}}$$

$$= 0.1 + 0.05 - \frac{6.5^2}{8 - 2 - 6.5}$$

$$= +84.35 \text{ inches}$$

Since H is the distance from the first to the second principal point, it is evident that the first principal point is still further in front of the lens than the second. The reader will do well to check this value of H by computing the distance from the front surface of the combination to the first principal point.

That is, compute the value of C from

$$C = F_2 \frac{W_{2,3}}{D}$$

and substitute numerical values in the following equation.

$$W_{2,3} + C' = H + C$$

A few Practical Methods for Measuring Equivalent Foci.

I.—*By the use of Newton's Rule.*

Mount the lens or combination, necessarily a convergent one, on a scale parallel to the optical axis. Determine by the use of parallel rays the positions of the first and second principal foci. Without moving the lens on the scale determine the positions of any two con-

jugate foci, preferably, of course, two whose distances from the principal foci can be measured with accuracy.

The distance of the first conjugate point from the first principal focus will be $K_{2,4}$, and the distance of the second conjugate point from the principal focus will be $K'_{2,4}$

Now by Eq. 26,

$$K_{2,4} K'_{2,4} = -F^2 \quad \ldots\ldots\ldots\ldots\ldots\ldots \quad \text{Eq. 43.}$$

$K_{2,4}$ and $K'_{2,4}$ are then the only quantities to be measured. If we are to examine a negative lens, it must first be combined with a stronger positive one, the latter of known focal length.

This method is not easy to carry out in practice, for it is difficult, ***without a more or less elaborate outfit***, to mark on a scale the position of an image with any high degree of accuracy.

The distance between the principal planes is here obtained by subtracting twice the equivalent focus from the distance between the principal foci. By noting the position of either surface of the lens on the scale one can determine the position of the principal points, and mark them on the mount of the lens.

II.—*MacGillavry's Method.**

The following method and reference I find in a lecture by Prof. S. P. Thompson, delivered before the Society of Arts,† on Nov. 27, 1891. MacGillavry mounts the lens so as to slide parallel to the optical axis. If the object and image be separated by a distance greater than four times the focal length plus the separation of the principal planes, there will be two positions of the lens in which the object and image will occupy the same positions relative to one another.

In one of these positions the image will be larger than the object; in the other, smaller.

The distance from the object to the nearer position of the *first* principal plane let us call M, the distance from the *second* principal plane to the image let us call N. H is the distance between the principal planes, and A the distance between image and object. Let ρ denote the magnifying power of the lens when in the position nearer the object. The distance between the two positions of the lens which give distinct focus at the fixed distance A, call Q.

* MacGillavry.—De bepaling der focaal-afstanden van samengestelde optische stelsels. *Mandblad voor Natuur-wetenschappen*, V., 1875, p. 73.

† In the journal of this Society for the above date the reader will find a large number of approximate methods given. Among these, however, the only strictly accurate ones are the first three of the present list.

Then we have

$$N - M = Q \quad \ldots \ldots \ldots \ldots \text{Eq. 43.}$$

$$N + M + H = A \quad \ldots \ldots \ldots \ldots \text{Eq. 44.}$$

$$\frac{N}{M} = \rho \quad \ldots \ldots \ldots \ldots \text{Eq. 45.}$$

and, by Newton's rule,

$$(N-F)\,(M-F) = F^2 \quad \ldots \ldots \ldots \ldots \text{Eq. 27.}$$

Solving these, one obtains,

$$H = \frac{Q + A - \rho\,(A - Q)}{1 - \rho} \quad \ldots \ldots \ldots \text{Eq. 46.}$$

and

$$F = \frac{\rho\,(A - H)}{(\rho + 1)^2} \quad \ldots \ldots \ldots \ldots \text{Eq. 47.}$$

or

$$F = \frac{Q + A - H}{2\,(\rho + 1)} \quad \ldots \ldots \ldots \ldots \text{Eq. 48.}$$

Now the quantity Q, it should be noted, is an exceedingly easy one to observe, for an index attached to any part of the mounting will serve to measure the displacement Q, as the lens is moved along the scale.

The distance A is more difficult to obtain. But dropping fine plumb lines, one in the focal plane and one in the conjugate, the distance between these threads can be measured in a variety of ways and with considerable accuracy.

The ratio, ρ, is confessedly the most difficult quantity to measure, unless one is provided with a good micrometer eyepiece.

In this case, the writer has found that a good method is to use for an object two parallel* spider webs, and then measure the ratio of the images with the micrometer eyepiece. The ratio of the images formed by the lens in its two positions will be

* A pair of spider webs can be brought to parallelism very readily by weighting them with small pieces of lead and suspending them so that the lower ends of the fibres with their attached weights dip into a small cup of oil; this last to prevent vibrations from wind currents.

$$\frac{\rho}{1/\rho} = \rho^2$$

Then from equations 27, 43 and 45 it follows that

$$F = \frac{\rho Q}{\rho^2 - 1} \quad \ldots\ldots\ldots\ldots\ldots \quad \text{Eq. 49.}$$

This expression is valuable because it avoids the measurement of the distance between the image and the object.

In illustration of this method, I have made the following measurements of Mr. Burnham's Laverne lens, a rectilinear doublet, and find

$A = 36.89$ inches.

$Q = 7.08$ inches.

$\rho = 1.485$ inches.

whence, by Eq. 46,

$H = + 0.468$ inches.

The principal points are then about half an inch apart.

For the value of the equivalent focus, we obtain

from Eq. 47, $F = 8.75$ inches

from Eq. 48, $F = 8.72$ inches

from Eq. 49, $F = 8.76$ inches

III.—*Cornu's Method.*

This is a variation of the first method given above. Cornu uses for an object some ink lines drawn on one surface of the lens. Then, with a long-focus microscope, he gets the distance between the principal focus and the image of these ink lines formed in the interior of the lens; he also obtains the distance from the second principal focus to the nearer surface of the lens. The lens is then reversed, and the same thing repeated for the other side. From these measures one obtains directly, by Newton's rule, the focal length and position of the principal planes.

IV.—*Pin-hole Method.*

This is a very handy method for a lens mounted in a camera.

Focus the lens on a very distant object, unscrew the lens from its mount, and replace it by a piece of cardboard with a small hole in it.

When the cardboard is put in a position where it gives an image on the ground glass of exactly the same size as that yielded by the lens, it then occupies the second principal plane of the lens.

The "equivalent focus," of course, is the distance from the cardboard to the ground glass.

If instead of this pin-hole one selects a cheap spectacle lens which will give an image of the required size, he will obtain a close approximation to the true focal length, especially if he corrects for the distance of the second principal plane of the lens from the back surface of it.

V.—*Method of Thomas Grubb.*

This method also depends upon the fact that the size of the image is a function of the "equivalent focus."

Mr. Grubb draws two parallel and vertical lines on the ground glass. He then focuses on a distant vertical line, say in the front of some building. The camera, being placed upon a table, is now turned so that the image of this line coincides with one of the pencil marks on the ground glass. Using one side of the camera, a line is now drawn upon the table. Next, the camera is turned so that the image of the distant vertical line now coincides with the *other* lead line on the ground glass. The side of the camera is again used as a ruler. Produce the two lines thus drawn upon the table until they meet. Call the angle at which they intersect θ, and the distance between the lead lines on the ground glass call D.

Then

$$D = 2\,F \sin.\frac{\theta}{2}$$

or

$$F = \frac{D}{2 \sin \theta/_2} \quad . \; . \; . \; . \; . \; . \; . \; . \; . \; . \qquad \text{Eq. 50.}$$

There are a number of methods besides these which we have just mentioned, but most of them are approximations to or modifications of the preceding. For all practical purposes one chooses that method for which he is best outfitted, provided, of course, the method is reasonably good.

What effect has the dark-room illumination upon a photographer who is color-blind?

OUR ILLUSTRATIONS.

By the courtesy of Drs. Keely and Davis, authors of "In Arctic Seas," we are enabled to present our readers portraits of Lieut. Robert E. Peary and his heroic wife who shared the Artic winter with her husband.

Lieut. Peary dnring his expedition to the frozen North, under the auspices of the Academy of Natural Sciences, has added another to the long and brilliant list of important scientific achievements which have been brought about by our old Philadelphia institution, viz., the determination of the Greenland ice cap.

The photographic outfit of both the main as well as the relief expedition was as complete as possible. The American Journal of Photography's special representative with the relief corps being especially well provided with largest Kodaks and Eastman films, some of the results will be brought before our readers at the earliest issue possible.

Our extra illustration, a copy in half-tone of the first mechanical reproduction in which a photographic process was utilized. The especial attention of our readers is again called to the "Historical Retrospect of the Dawn of Photography," now being published in the American Journal of Photography. All the facts and illustrations given are obtained from authentic sources, many of which are now for the first time presented to the photographic world at large.

Snap Shots at Sails.—On September 9th the California Camera Club of San Francisco paid a visit to the Oakland Canoe Club. About twenty-five members of the former organization came across the bay early in the morning, and were escorted to the boathouse by the officers of the Oakland club. In the early part of the day the Canoe men showed their guests over their buildings and manned their best canoes that the visitors might poke the eyes of their assorted cameras at them, and just after noon a delicious luncheon was served in the larger clubhouse.

In the afternoon a programme of races was carried out for the entertainment of the visiting artists, and the excitement of the sailors of the little craft. The first race was a very unexciting one owing to the light breeze and the difficulty in getting around the stakeboat. A novice race for a silver cup followed. The paddling race was the feature of the day, and was most enjoyed by the visitors. The tub tournament was declared a draw. After the races the members of the Camera Club were taken out in the boats for a few hours' ride along the city front.

DRY PLATE AS DETECTIVE.

IT is well-known that the photographic camera is keener in distinguishing things than the human eye. The case is well-known of the photographer who took a picture of a woman who appeared to be in good health, and whose skin seemed perfectly normal to the eyes of those who met her. But in the photographic negative there were a lot of queer spots or freckles upon the face which the photographer could not account for; they were not due to anything in the process of taking the picture, and they did not appear to be in the sitter's face, but in twenty-four hours the woman came down with small-pox, and it turned out that the camera had detected the spots in the skin which no eye could as yet perceive. Well, the case is one in which, so to speak, the camera has detected a kind of moral spotting on a human face.

A person whose parents on both sides had been very bad in various ways, and who, under the laws of heredity, was thoroughly entitled to be bad, too. was, on the contrary, very ememplary and thoroughly well behaved. Furthermore. this person was handsome and noble of feature, and gentle and winning in facial expression. All who saw the face were at once prepossessed by it.

But whenever this person was photographed something cruel and criminal was sure to be revealed in the picture. If one had been an expert in criminal neurology, if there is any such science, he might have said, when asked to give an opinion of the character of the subject from the photograph: "This person is a forger or embezzler on a large scale, with a strong tendency toward counterfeiting, and a perceptible leaning in the direction of homicide." All the vices of the person's ancestors seemed to be revealed in the photograph. Perhaps this supernatural sensitiveness of the chemically-prepared plate accounts for the fact that a photograph can almost always be depended upon to bring out the worst hat there is in one. Of course, there is something vicious in everybody's ancestry, since everybody's ancestry takes in the entire population of a great country if you go back far enough.

The viciousness that there is in you is latent in your disposition, owing to favorable circumstances and influence, but it is not latent in the chemically-prepared plate, which has no moral side to make allowance with; it spies out the traces of the stifled hankerings, and perceives otherwise invisible evidences of completely suppressed besetting sins, and these it candidly reports on the photographic print. We say that the photograph is truthful, but it isn't. If it reports a person a liar and a murderer who is nothing of the kind, but who has in his face some ordinary unperceived lines which are there because some of his ancestors were bad, it is a false thing.—*Boston Evening Transcript.*

CHANGES IN THE STAFF AT THE LICK OBSERVATORY.

IT has been known for some time, according to *Astronomy and Astro Physics*, that important changes were contemplated in the Staff of Lick Observatory. This has been understood by some astronomers acquainted with the personnel at Mount Hamilton, and it has also been noticed in the leading papers of San Francisco during the last two months. Hints that all things were not moving smoothly appeared in the resignation of Professor Keeler in the spring of 1891. Later Mr. Burnham has resigned, and now it appears that Professor Henry Crew is to exchange his place for the professorship of Physics in the Northwestern University at Evanston, Ill.; both of the latter gentlemen being well known to our readers from their valued contributions to the AMERICAN JOURNAL OF PHOTOGRAPHY.

It is true that Professor Keeler was invited back to the Allegheny Observatory to take its directorship in the stead of our distinguished Langley, an honor indeed that he might well covet, but it was the wonder of his wider circle of friends that he should choose to leave the finest equipment of astronomical instruments in the world for another at present very ordinary, if not positively inferior, for common lines of modern research. Astronomers, the world over, know that Professor Keeler is a leading authority in

spectroscopy, and that he had designed and most successfully used one of the most effective instruments in this research now known to the science. It is also well known that he had gained in a short time, for a young man, an enviable reputation at home and abroad by skillful work and astonishing results in the new and difficult spectroscopic study of the nebulæ. So true is this, that his dicta in regard to the character and meaning of nebular spectra have been received as high authority everywhere by the best talent in astro-physics. Now it seems very strange that Professor Keeler should easily give up all this bright prospect, and be content to wait a long time before it can be possible for him to take up his delightful work where he left it more than a year ago. We think astronomers generally will wonder why Professor Keeler should abandon such a position as he held at the Lick Observatory, and so deprive himself and astronomy of the benefits in spectroscopical research which he was peculiarly fitted to prosecute.

The cause of Mr. Burnham's resignation is also unknown. We have no theory to advance about it, but we remember his connection with the Lick Observatory from the first with personal interest and personal pride. We need hardly say to the readers of this journal that Sherman Wesley Burnham in 1879 was chosen by those in authority as expert observer to go to California and determine the particular mountain site where, later, the Lick Observatory should be located; and that subsequently it was his report and his judgment of the fitness of the site at Mount Hamilton that led to its adoption more than that of any other man so far as we know. In a special sense would Mr. Burnham feel an interest in the growth and maintenance of that grand Observatory, since it was his work of testing the site with his immortal six-inch telescope, and the discoveries of double-stars there made in the first scientific expedition to the mountain top, that gave the beginning of interest in Mount Hamilton as a suitable point for astronomical work. Since that time Mr. Burnham has been identified in many important ways with the growth and the success of this great Observatory. His double star work must be acknowledged as without an equal anywhere. His catalogues, his standing in the Royal Astronomical Society of

England, and in other scientific societies on the continent, fully attest this. His practical knowledge of photography and his studious application of it to various fields of astronomical work have gained for him wide reputation as not only an artist, but an authority in this branch of science. In view of all this, it is a wonder that Mr. Burnham should leave Lick Observatory and accept the position of a clerk in one of the courts of Chicago. It is true that the new position pays a higher salary than that of senior astronomer in the Lick Observatory, but we are not aware that Mr. Burnham ever complained of the smallness of salary in any position that he ever held, however small. He is not that kind of a man; his mind and his purpose are too large to be swayed by such motives. This could hardly be true anyhow in regard to the positions at Mount Hamilton, for they are all reasonably well paid in view of all the circumstances.

But the thing most to be regretted in these late changes, is the fact that this great Observatory is rapidly losing its great men. As necessary as powerful instruments are to high success in modern research, it must never be forgotten that men are more than instruments. Whatever the position, the *man* must rank his place and his instruments, or he will degrade both. That Director Holden has done masterful work in building up the Lick Observatory so far is admitted on every hand. That was no small thing to do. It was well done; not perfectly, as he well knows, and himself says, but still it was well done. And one of the best things in his part of it was that he had the foresight to select and the ability to secure for his staff some of the best men to be found in the United States, In this he was eminently wise. But now that these excellent men are rapidly leaving the Observatory, it is not evident that he is wise in permitting this, if it lies in his power to prevent it. In any phase of the matter, it is a calamity to the Observatory and to astronomy. For first-rate men, like any others, can do better work the longer they remain in one position, other things being equal. New men cannot master large and delicate instruments in a day. It requires many a day of painstaking labor and waiting for the skilful astronomer to get from his fine instrument the very best that it

can give. It may do for manager Frick at the Homestead Mills to say that he can easily get others to take the places of his trained men to work his improved machinery, and turn out just as good armor plate as in the past, but his skilled workmen know better. Much more is this true in scientific work, and we believe no one knows it better than does Professor Holden, and it is not probable that any course will be taken in the future which shall not be for the best interest of the Lick Observatory and for Astronomy in general.

As we close this paragraph, the news comes to us that Professor Henry Crew, of Lick Observatory, has been elected Professor of Physics in the Northwestern University at Evanston, Ill. We are also informed that he will probably accept the position. Mr. Barnard and Mr. Schaeberle are the remaining older members of the staff.

A well-known artist, who hitherto has been a great enthusiast for the propagation of "art among the masses," sends us the following story, which leads him to take a rather gloomy view of the situation. For the purpose of a picture on which he was engaged he required a well-kept donkey as a model, and commissioned a friend to hire such an animal. A costermonger was found possessed of one in every way suitable, and was told that an artist would be glad to paint the "moke." The owner looked annoyed, even angry, at the request. Later he called at the gentleman's house, and said, "I understand you want to paint my donkey?" "Yes," replied the artist, "I shall be very much pleased if you will allow me." "Why," continued the coster, "ain't he a good enough color already?" From a painter's point of view the question was unanswerable, and set the artist pondering on the great work that still remains to be done in the art education of the people.—*London Telegraph.*

It would be interesting to know just what was the standard of ex cellence adopted by the judges at the late exhibition at Boston. An inspection of the exhibits returned to this city, certainly shows several surprises. Granting that it is true that the specimens sent by no means represent the amateur or professional work of Philadelphia or the local society in particular, it is to the unbiased spectator at least strange that the result should have been as announced.

Photographic Hints and Formulæ.

Rodinal.—The manufacturer of this new developing agent in Germany, furnishes the following formulae as giving the best results:—

Normal exposures: rodinal, 1 part; water, 30 parts.

Over-exposures: rodinal, 1 part; water, 30 parts. Brom. potassium as needed, or old developer.

Fixing bath: water, 100 parts; sulph. soda cryst., 5 parts; sulph. acid c. p., 1 part; then add, hypo. soda, 20 parts.

For lantern slides, Ellerslie Wallace: rodinal, 1 part; water, 30 parts. To 4 ozs. of above, add 10 drops of stock solution.

Under-exposures: rodinal, 1 part; water, 40 parts.

For strong negatives; rodinal, 1 part; water, 20 parts. Brom. potass. as needed.

For over-exposures: rodinal, 2 drams; water, 4 ozs.

For normal exposures: rodinal, 2 drams; water, 6 ozs.

For extremely over-exposed plates: rodinal, 2 drams; water, 2 ozs. Bromide solution. A few drops of a 20 gr. solution bromide potassium.

Formulae by W. S. Davis, for instantaneous exposures: rodinal, 2 drams; water, 8 ozs. Carb. potash, 50 grain solution, 2 to 5 drops.

This will develope a plate, so far overtimed that it would be worthless with any other developer now known.

The Arrangement of Slides for Exhibiting.—Slides should be arranged in the order in which they are to be placed in the lantern, regardless of their shapes or sizes. It may cause a little inconvenience to find a place to so arrange them, but it would be a great deal more inconvenient if the slides were placed in the lantern wrong. Some lecturers think all that is necessary is to furnish a printed list of the slides in the order in which they are to be presented, and that the operator can pick them out just to correspond with that list. Theoretically this is a very pretty way of proceeding, but practically it is of no use. The operator will have all the time that is at his disposal fully occupied in attending to his instrument, especially if he use the oxy-hydrogen or oxy-ether light. If the slides are not so arranged, a similarity of names on a written list would perhaps lead him to get the wrong pictures first; and then again the slides should be placed all in one position,—that is, so arranged that they can be picked up and placed in the lantern without any examination as to whether they are upside down or wrong end foremost, because it is very difficult in a darkened room to distinguish the right way from the wrong way. What is better still, each slide should be labeled; at the lower left-hand

corner of the right side of the slide will be found the best place to put the label, for this is the part of the slide on which he will place his thumb when he puts the slide into the lantern, if working them from the right-hand side.—*The Exhibitor.*

A well deserved honor has been paid to a Philadelphia inventor by the Royal Society of Arts of Great Britain, a silver medal having been awarded to Mr. Frederic E. Ives, for his paper on "Composite Heliochromy," read before that body a few weeks ago. British scientists have recognized in Mr. Ives's work the nearest approach which has yet been made to photography in the colors of nature.

Progress in Photography.—The *London News* lately regaled its readers with the following account of photographic progress. It is needless to state that the wonderful discovery emanates from sunny France.

"A map of the heavens is being prepared at a cost of £1,200,000 (which the leading nations have agreed to raise), as an example of what telescope photography can do. Instantaneous photography seems to have attained perfection, for it is now possible to fix the image of a cannon ball flying through the air. Even microbes are now being photographed. A young French chemist, M. Henri Courtonne, is credited with a new discovery, for which we have been looking to Mr. Edison. Sound being transmissible by telephone, M. Courtonne argued by a rigorous analogy that light might be transmitted too. As the telephone consists of a transmitter, a wire, and a receiver, so there was reason to believe that these three organs might be adapted for transmitting light vibrations, and for this purpose the transmitter and receiver should be prepared chemically for receiving and giving out light instead of sound vibrations. This was done by substituting sensitized photographic plates for the ordinary telephone plate. One of the plates was placed in front of an aperture through which an image was cast, and this image has been forwarded by wire and has been seen at the other end. The first apparatus was very imperfect, and M. Courtonne having heard that Mr. Edison was on the track of a similar discovery, resolved to publish his experiments, a description of which he, however, sent in a sealed letter to the Academy in 1889. This letter is only to be opened at the sender's request.

"The *Figaro* says that the consequences of the telephotography cannot be over-estimated. To-morrow, it says, you will see in Paris the image of a man smoking in St. Petersburg."

When giving a lecture on hand-cameras, Mr. W. D. Welford thus summed up the requisite qualities necessary for a hand-camerist: "He

must be of quick perception, prompt decision, and instant action, although at the same time he must be coolness itself."

A New Process Discovered for Manufacturing Aluminium.—A private exhibition to a few interested capitalists, says the Philadelphia *Ledger*, was given a short time ago, of the new process for making aluminium invented by Colonel William Frishmuth, at the laboratory of the Enterprise Aluminium Company, Rush and Amber streets. The process is a secret one in certain particulars, but the general method was demonstrated to the company present.

The process is partly chemical and partly electrical, the aluminium oxide being extracted from pure clay and dissolved. The solution is then exposed to the electric current, which causes the pure metal to be thrown down on brass plates. From this it is removed by an ingenious but very simple chemical process in a state of almost perfect purity, and in the form of a silvery impalpable powder. It only remains to smelt it into ingots.

Colonel Frishmuth estimates that the aluminium can be extracted at a price far below its present market value, and in any desired quantity. But a singular circumstance connected with it is that the bye-product or residue from the chemical treatment of the clay possesses high value as a fertilizer, and this, it is claimed, will be sufficient to pay all the expenses of the operation. An analysis of the bye-product, made by an expert chemist without knowledge of how it was produced, was submitted. He estimated its value as a fertilizer at from $8 to $10 per ton.

A chart has been procured and a company formed, which will immediately proceed to manufacture the metal commercially. It is designed to operate the first plant in this city for a time, the clay being brought here from New Jersey, where a bed free from deleterious substances is found. The promoters are so confident of success that they think that in a short time the profits will enable them to put up extensive works in the immediate vicinity of the beds.

I heard a "missionary" (that is a traveling man) once say that he would not go on the road for a firm that didn't advertise, for it took too much valuable time to explain to every supposed buyer who he was, where he came from, and what the merits of his goods were. He said, moreover, that if the buyer had all this imformation beforehand he generally received him cordially, was glad to see him, and had been looking for him for some time.—*Ex.*

Telegraphing through the Air without Wires.—Professor John Trowbridge of Harvard University, describes in the April issue of *The Chautauquan*, a series of experiments made by himself in telegraphing through the air without wires. The results of the various methods led him to decide against their practicability, but he concludes thus hopefully: Some time in the future we may find means of modifying the electrical condition of the earth—we will say to Chicago—so that a point at its antipodes will respond. When this is done, treaties of electrical reciprocity will have to be entered into between China and the United States.

The Germans propose to pass a law protecting business secrets. Several cases recently have become known where valuable hints were obtained through bribing workmen, or through sending experts into factories as common workmen. They of course only stayed long enough to obtain the necessary information and immediately afterwards sold it to a rival firm. Heavy punishment is to stop these proceedings.

A Human Analysis.—Dr. Lancaster, the famous London physician and surgeon, who analyzed the body of a man in the year 1875, gives the following result of his unique experiment: The body operated upon weighed 158 pounds exactly. From this mass of flesh, bones, muscles, etc., he obtained 23.1 pounds of carbon, 2.2 pounds of lime, 22.3 ounces of phosphorus, and 1 ounce each of sodium (salt), iron, potassium, magnesium, and silicon. Besides the above "solids" he obtained from the same subject 5,565 cubic feet of oxygen and 105,000 cubic feet of hydrogen, this latter weighing 15 pounds 4 ounces, and 52 cubic feet of nitrogen. All these elements combined into the following: one hundred and twenty-one pounds of water, 16 pounds of gelatine, 1¼ pounds fat, 8 pounds of fibrin and albumen, 7 pounds of phosphate of lime, and 2⅔ pounds of other mineral substances.

Under the circumstances it is asking a little too much to expect the registered Celestials to "look pleasant" while those photographs are being taken.—*Baltimore American.*

The *London Globe* gets off the following,—our report fails to state whether a sudden suspension of animation resulted from the effort—viz., regarding Ives's and Lippman's experiments in the direction of colored photographs. It said: "There will be many a slip, man, 'twixt Ives and 'twixt Lippmann, ere the difficulties are surmounted."

In the Twilight Hour.

ONE may live as a Conqueror, a King or Magistrate, but he must die as a man. The bed of death brings every man to his pure indiviuality, to the intense contemplation of that deepest and most solemn of all relations—the relation between the creature and his Creator. Here it is that fame and renown must fail to assist us, that all external things must fail to aid us; that friends, affection and human love and devotedness cannot succor us.

MONEY and time are the heaviest burdens of life, and the unhappiest of all mortals are those who have more of either than they know how to use.

THE miserable have no other medicine
But only hope.
—Measure for Measure, Act III., Scene 1.

SOME are born great, some achieve greatness, and some have greatness thrust upon them.—*Twelfth Night, Act III., Scene 4.*

PRESENT fears are less than horrible imaginings.—*Macbeth, Act I., Scene 2.*

'TIS my vocation, Hal; 'tis no sin for a man to labor in his vocation.—*Henry IV., Act I., Scene 2.*

SORROW breaks seasons and reposing hours,
Makes the night morning, and the noontide night.
—King Richard III., Act I., Scene 2.

MEN must endure
Their going hence, even as their coming hither.
—King Lear, Act IV., Scene 2.

O SWEAR not by the moon, the incontant moon,
That monthly changes in her circled orb,
Lest that thy love prove likewise variable.
—Romeo and Juliet, Act III., Scene 2.

BEWARE the Ides of March.
—Julius Cæsar, Act I., Scene 2.

THERE are more things in heaven and earth, Horatio,
Than are dreamt of in our philosophy.
—Hamlet, Act I., Scene 2.

LITTLE PLEASURES often banish melancholy better than higher and more exalted objects. No means ought to be thought to be too trifling which can oppose it either in ourselves or others.

OPPORTUNITY is the flower of time; and as the stalk may remain when the flower is cut off, so time may remain with us when opportunity is gone forever.

HE that sinks his vessel by overloading it, though it be with gold and silver and precious stones, will give his owner but an ill account of his voyage.—*Locke.*

IN private conversation between intimate friends the wisest men very often talk like the weakest; for, indeed, the talking with a friend is nothing else but talking aloud.

THE LAUGH of mirth that vibrates through the heart, the tears that freshen the dry wastes within, the music that brings childhood back, the prayer that calls the future near, the doubt that makes us meditate, the death that startles us with mystery, the hardship which forces us to struggle, the anxiety that ends in trust,—are all the true nourishment of our being.

WE NEVER respect persons who aim simply to amuse us. There is a vast difference between those we call amusing men and those we denominate entertaining; we laugh with the former, and reflect with the latter.

GOOD-BREEDING carries along with it a dignity that is respected by the most petulant. Ill-breeding invites and authorizes the familiarity of the most timid.

Literary and Business Notes.

HANDBUCH DER PHOTOGRAPHIE. By Major Giuseppe Pizzighelli. Vol. II. Second Edition. Published by Wilhelm Knapp, Halle a. S.

The demand for this handbook has made a second edition necessary. It is one of the best handbooks written in the German language. The present volume contains no less than five hundred and eighteen pages of information, illustrated by two hundred and seven illustrations printed in the text.

After a general introduction on the principles of the photographic processes in general, the main portion of the book is devoted to the negative and positive processes. Not the least important are the two concluding chapters treating on the "Determination of Time of Exposure" and the "Determination of Rapidity for Instantaneous Exposures." No library of a photographic student who can read German is complete without this handbook of comprehensive and practical knowledge.

PHOTOGRAPHIC ANNUAL FOR 1892. Edited by Henry Strumey. London: Iliffe & Son, 3 St. Bride St., Ludgate Circus, E. C. Price, half a crown.

A compendium of information and statistics of the year. The largest of all photographic annuals, almost a thousand pages of photographic information, fully illustrated with cuts in the text in addition to numerous full-page illustrations. Among the latter we recognize, on page 280, a gem from the AMERICAN JOURNAL OF PHOTOGRAPHY under a new title.

The Annual contains many useful tables of reference for practical workers. Tips for tyros, the sections devoted to photographic apparatus, chemicals, and manipulations are all replete with information. The lantern and appliances are also fully treated. The section on photographic trade-marks is an interesting novelty. "Photographic Annual" has a deservedly large sale in America as well as England.

PHOTOGRAPHISCHER ZEITVERTREIB. Herman Schnauss, Düsseldorf, 1892. Ed. Liesegang, Publisher.

A compilation of simple and easily-performed experiments with the camera. Third edition, 176 pages, with one hundred and ten illustrations. The book is divided into five sections, treating on photographic specialties, curiosities, home resources, photo-optical divertisements, and photographic copies. Translations of the book have been made into Russian and English. The work is interesting and entertaining.

CRAYON PORTRAITURE. By J. A. Barhydt. Illustrated. New York: The Baker & Taylor Company.

Mr. Barhydt, author of the articles on "Crayon Portraiture" in "Appleton's Annual Encyclopædia," 1890, publishes a revised and enlarged edition of his handbook for professional and amateur artists. This contains complete instructions for making crayon portraits on crayon paper, and on platinum, silver, and bromide enlargements. The coloring of photographs, engravings, and photogravures with transparent liquid water colors, and the making of French crystals, are fully treated. The manual has been carefully prepared, and furnishes a full knowledge of materials required for crayon work and directions for their use, manipulation, and all processes involved. An examinatian of the book proves that the field is entirely covered, and the requirements in the way of instruction have been fully met by Mr. Barhydt.

RECENT PATENTS.

ISSUE OF AUGUST 2D, 1892.

There were no photographic patents included in this issue.

ISSUE OF AUGUST 9TH, 1892.

There were no photographic patents included in this issue.

ISSUE OF AUGUST 16TH, 1892.

480,950.—Album clasp, J. C. Koch, St. Louis, Mo.
481,117.—Picture-frame fastener, C. F. Naegele, New York, N. Y.
480,953.—Picture-frame, J. Mauerhofer, New York, N. Y.
480,808.—Camera attachment, E. DeMoulin, Greenville, Ill.
480,995.—Camera shutter, W. H. Bristol, Hoboken, N. J.

ISSUE OF AUGUST 23D, 1892.

481,343.—Camera shutter, William H. Bristol, Hoboken, N. J.
481,333.—Frame for pictures, etc., Mayer Reinfeld, St. Louis, Mo.
481,217.—Picture frame, Paul Wiener, Chicago, Ill.

A Would-be Amateur.—A visitor to Birmingham Park was witness to an amusing and diverting incident. When the train which leaves West Chester at 1 p. m. arrived at the Park, there was quite a crowd to alight—and among them two women of good weight. They clasped hands and skipped along the sward to show folks, as they said, that stout and staid folk could be hilarious upon occasion. One of them, observing a photographer's camera placed, went up to it and asked a third party to pose for a picture, which she did, but lo! the tripod rested upon an incline, and, upon being jarred, toppled over, and the camera rolled down the hill, scattering the broken glass as it fell. The faces changed from round to oblong visages, but our would-be amateur artist stepped to the fore, and, while acknowledging she should not have disturbed it, offered to pay all damages, which the operator decided would be forty dollars. The party proceeded to the Park a sadder and wiser lot. Many learning of the accident, offered sympathy and felt the assessment extortionate, so made inquiry and learned that was the case. Later the unfortunate individual returned to the artist and found him taking pictures as usual. Still she insisted upon paying something, but as the loss amounted to ten cents only, the value of the ground glass, the affair was settled for one dollar. The one who posed for the picture says she has often heard of people breaking the glass with their beauty and she is now decided as to her personal appearance, but she will never forget her impressions as the camera came bounding toward her. The entire occurrence is hugely enjoyed now in the retrospect.